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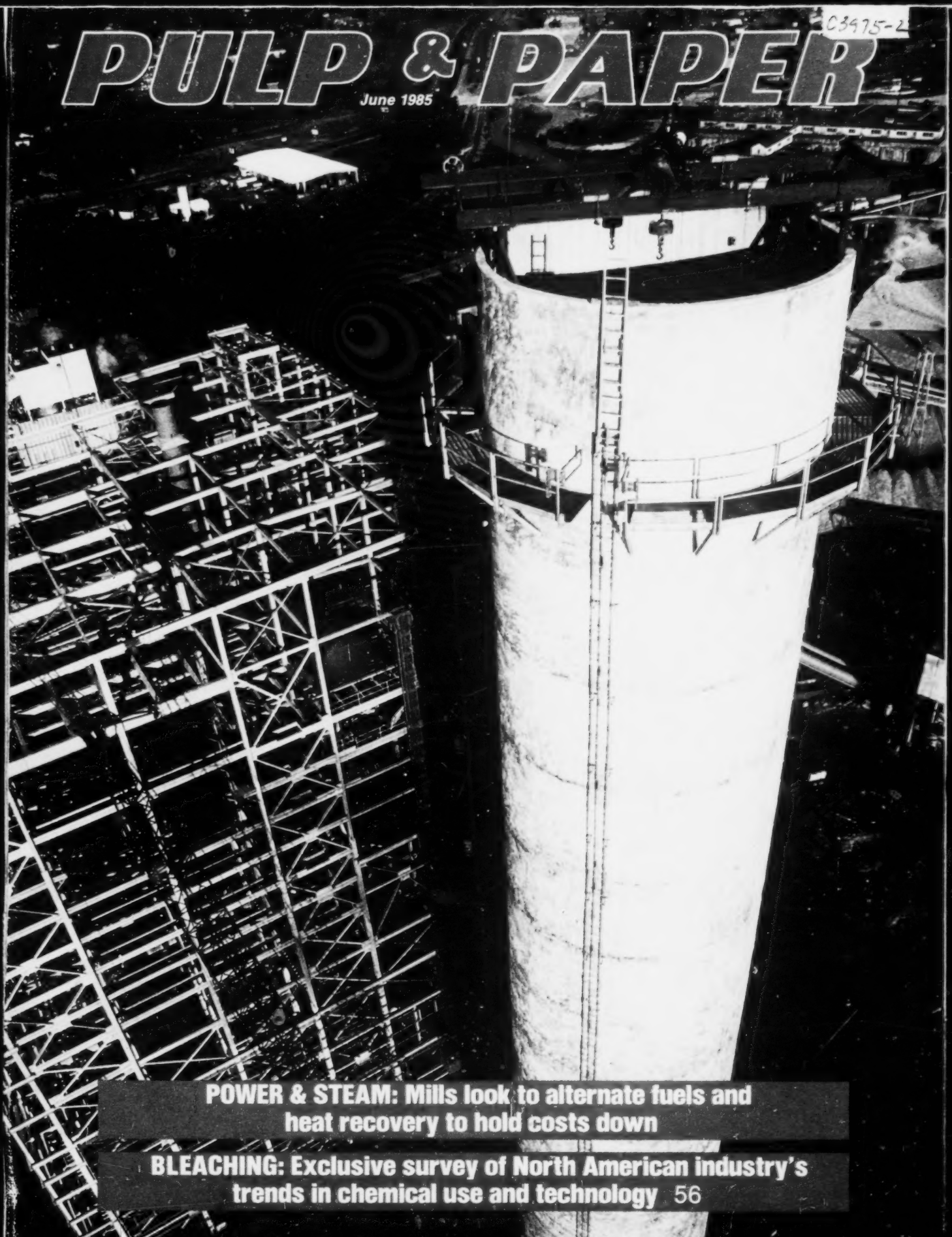
PULP & PAPER

June 1985



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Technical Artist Janet Duncan SF

Office locations

AT = Atlanta: 2700 Cumberland Parkway N.W., Suite 590, Atlanta, Ga. 30339; (404) 432-3186; Telex 275015
SF = San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
NY = New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-8294; Telex 220442
BR = Brussels: Chaussée de Charleroi 123a, Boîte 5, B-1060, Brussels, Belgium; Telex 846-24672

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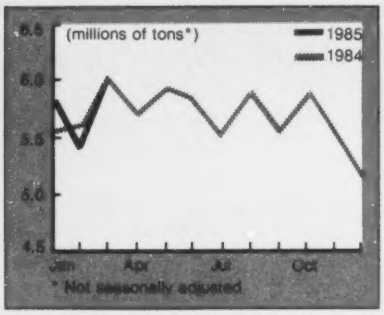
U.S. paper and board production



U.S. production of paper and paperboard totaled 5.98 million tons in March, down 0.9% compared to last year, according to the American Paper Institute. Production for the first quarter was at a seasonally adjusted annual rate of 68.1 million tons, about the same as the 1984 fourth quarter but 0.3% below the year-ago period. The two-month moving average of seasonally adjusted data shows production trending downward, dropping from 69.5 million tpy in January to 67.3 million tpy in March. Preliminary data for April shows a further drop, API said.

Among major grades, paper production was fairly strong in the first quarter, with printing and writing papers flat compared to last year. Paperboard grades were down somewhat compared to last year, but most of the decline was in "other grades" and linerboard production for export, which fell 24% from 1984. Corrugated box shipments dropped 8.7% in March to 23.777 billion ft², the Fibre Box Assn. said.

Canadian newsprint shipments through the first quarter jumped 11.7% compared to last year, according to the Canadian Pulp & Paper Assn. The March operating rate was 94%, down from 95% last month. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Mar.	489	2.3	5,618	1.0
Uncoated groundwood (s)	Mar.	135	−5.6	1,518	−5.9
Coated paper (s)	Mar.	535	−0.4	6,377	2.8
Uncoated free sheet (s)	Mar.	820	4.9	9,461	0.5
Other printing/writing	Mar.	137	4.6	1,489	−13.9
Total packaging and other paper (s)	Mar.	455	−13.7	5,379	−8.4
Tissue	Mar.	430	0.9	4,953	1.7
Total paper	**Mar.**	**3,001**	**−0.7**	**34,794**	**−0.6**
Unbleached kraft paperboard	Mar.	1,504	0.5	16,774	−1.4
Semichemical medium	Mar.	430	−4.9	4,991	−3.4
Bleached paperboard	Mar.	350	−2.0	3,984	−2.2
Recycled paperboard	Mar.	693	−1.3	7,967	−3.1
Total paperboard	**Mar.**	**2,976**	**−1.0**	**33,716**	**−2.4**
Total U.S. paper and paperboard output	**Mar.**	**5,978**	**−0.9**	**68,510**	**−1.5**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Feb.	4,359	−3.9	53,724	−0.8
Market pulp production	Feb.	588	4.3	7,002	5.7
Wastepaper consumption at paper/board mills	Feb.	1,206	−5.5	15,366	−1.3
Pulpwood consumption (cords)	Feb.	6,981	−4.3	86,364	−0.6
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Mar.	23.777	−8.7	67.241[6]	−0.7
Containerboard inventories at U.S. box plants and mills	Mar. 1	2,959	2.2		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Feb.	439	−46.1	1,057	5.2
Imports of Canadian newsprint	Feb.	281	−54.1	7,678	1.4
U.S. paper exports (including products)	Feb.	173	−46.6	3,766	−4.8
Exports of unbleached kraft linerboard	Mar.	138	−27.4	1,509	−24.0
Exports of woodpulp	Feb.	223	−29.7	3,144	−9.2
Norscan pulp inventories[4]	Mar. 31	1,762	−6.4		
Norscan pulp operating rates[4]	Mar.	89%	92%	90%	89%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Mar.	806	19.7	2,254[6]	11.7
Operating rates	Mar.	94%	95%	94%	94%
Inventories held by U.S. consumers	Mar. 31	1,535	24.4		
Other paper/board shipments	Mar.	266	19.8	764	13.2
Woodpulp shipments (export only)	Mar.	604	37.0	1,614[6]	8.5
Operating rates	Mar.	90%	60%	89%	72%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

CORRUGATING MEDIUM: Flat output expected in 1985 as mills reduce inventory levels

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. In 1984, about 78% of corrugating medium was made from semichemical furnish (which normally contains at least 20% recycled fiber), and 22% was "bogus" medium made from wastepaper. Basis weights of corrugating medium are 22, 26, 33, and 36 lb/1,000 ft². Standard sheet weight is 26 lb, which accounts for more than 80% of production. Recycled medium for equivalent uses is normally produced in slightly higher weights.

Production/capacity: Production of corrugating medium surged 8.5% in 1984 compared with the previous year, to nearly 6.6 million tons. Semichemical medium production increased 9.1% to 5.2 million tons, while recycled medium output rose 6.5% to 1.4 million tons. Semichemical medium mills operated at almost 99% of capacity in 1984 compared with 92% in 1983, while recycled medium mills ran at 94% last year.

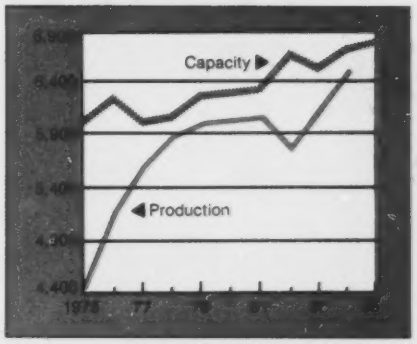
Corrugated box shipments rose 5.9% in 1984 and, unfortunately, a significant portion of the increase in medium production went into inventory. Inventories of medium at box plants and mills at the beginning of 1985 of 773,000 tons (7.1 weeks of supply) were 153,000 tons higher than those of a year earlier. High production levels on existing machines, reactivation of several idle machines, increased imports from Canada, and a dropoff in exports have all contributed to the inventory buildup.

Outlook: Corrugated box shipments are forecast to rise only about 1.5% this year due to the impact of the strong dollar on industrial production. As a result, production of corrugating medium should be relatively flat at around 6.6 million tons, assuming about a 100,000-ton reduction in inventory levels. With only limited capacity growth this year, operating rates for semichemical medium will decline to around 97%, while recycled medium mills will continue to run at about 94%.

No new semichemical medium machines have been announced, and capacity is expected to grow at only about 1%/year over the entire 1985-87 period. This suggests a return to tighter market conditions once inventories have been reduced—barring a recession sometime next year. Recycled medium, however, may show somewhat faster capacity growth. Chesapeake Corp. will convert a linerboard machine at its West Point, Va., mill to 153,000 tpy of recycled medium in late 1986, and International Paper Co. eventually plans to produce recycled containerboard at a recently acquired mill in Riegelsville, Pa., which has been idle.

Pricing: Corrugating medium producers tried to push through a $30/ton price increase in the fall of 1984. The increase would have brought the price of 26-lb semichemical medium to $340/short ton in the eastern U.S., but it never really took effect. Discounting since then has driven the price to about $270 to $280/short ton in the independent box market, with some sales at even lower levels. Average price levels are probably close to break-even or unprofitable for most U.S. mills. Prices may begin to firm this fall if inventories are brought down to more normal levels and box shipments strengthen.

Price history at year-end for 26-lb semichemical medium in the eastern U.S. is as follows: 1975, $200; 1976, $200; 1977, $180; 1978, $210; 1979, $260; 1980, $260; 1981, $260; 1982, $240; 1983, $280; 1984, $310 (with discounting).



	1983	1984	1985e
Production[1]			
Semichemical	4,731	5,162	5,150
Recycled[1]	1,306	1,391	1,400
Total	**6,037**	**6,553**	**6,550**
Capacity			
Semichemical	5,119	5,219	5,299
Recycled	1,427	1,482	1,493
Utilization rates (%)			
Semichemical	92.4	98.9	97.2
Recycled	91.5	93.9	93.8
Imports[2]	70	104	120
Exports[2]	74	50	50
Apparent U.S. consumption			
000 tons	6,033	6,607	6,620
lb/capita	51.5	56.3	56.2
GNP ratio	3.93	4.03	3.92

1. Production for domestic use only.
2. Semichemical medium only (Dept. of Commerce data).

	Annual capacity			Market share (%)
	Semi-chem	Recycled medium	Total	
1. Weyco	619	—	619	9.1
2. O-I	605	—	605	8.9
3. Stone	415	85	500	7.4
4. Inland	190	250	440	6.5
5. Champion	212	210	422	5.7
6. Willamette	230	120	350	5.2
7. Mead	330	—	330	4.9
8. IP	320	—	320	4.7
9. CCA	115	160	275	4.0
10. Va. Fibre	257	—	257	3.8
11. PCA	255	—	255	3.8
12. Smurfit	31[1]	210	241	3.5
13. G-P	225[2]	—	225	3.3
14. MacBlo	215[3]	—	215	3.2

Market share of top five companies: **38.1%**
Market share of top ten companies: **60.8%**
Total U.S. capacity (1985):
6.792[4] million short tons

1. Reflects 31% interest in 100,000-tpy mill of Groveton Paper Board.
2. Includes 50% interest in 130,000 tpy machine at Sonoco Products' Hartsville, S.C., mill.
3. Excludes 78,000 tpy of capacity at Sturgeon, Ont.
4. Semichemical and recycled combined.

SALES & EARNINGS

First quarter U.S. paper profits flat due to price discounting in many grades

U.S. paper industry profits rose 2.6% on a 5.7% increase in sales, according to a *Pulp & Paper* survey of 32 companies' results. The relatively flat profit performance after last year's series of strong quarterly gains reflected price discounting in many grades related to the strong U.S. dollar and also to overcapacity in some segments. Profits from wood products operations remained depressed, although in some instances they showed improvement over the first quarter of last year.

"Coated papers enjoyed strong demand and improved prices while newsprint also performed well. In contrast, uncoated white papers suffered from price discounting. Prices for market pulp and linerboard also continued to be weak," said John B. Fery, chairman and CEO of Boise Cascade Corp., summing up the mixed performance of various grade segments. Boise Cascade reported a 19.4% increase in profits on a 1% decline in sales compared with the first quarter of 1984.

Coated paper profits. Champion International Corp. recorded a 50% rise in earnings on a 43% jump in sales. The results show the first full quarter of 100% consolidation of St. Regis Corp.'s earnings with those of Champion. Champion led the industry in first-quarter sales at $1.65 billion. Results for publication papers continued to improve, and newsprint and uncoated grades were off. But price erosion on uncoated grades appeared to bottom out by the end of the quarter, according to Champion sources.

The firm market for lightweight coated paper contributed to the 73% rise in earnings for Bowater Inc., assisted by a healthy demand for newsprint. Nevertheless, Anthony P. Gammie, chairman and CEO, commented, "The strong U.S. dollar coupled with industry oversupply continued to depress margins for the company's market pulp sales. However, there are some indications that the bottom may now have been reached and that profit margins should begin to make a recovery in the subsequent quarters of this year."

Capacity operations in the coated printing papers area, combined with some price improvements plus increased tax credits were the major factors for Consolidated Papers Inc.'s brilliant 41% increase in earnings to a new record for the first quarter of this year.

Uncoated free sheet. Great Northern Nekoosa Corp. reported a 53% drop in first-quarter earnings due to a "deterioration in prices" for many of GNN's products. In 1984 net income had benefited from tax credits and capitalization of interest attributable to the Leaf River pulp mill construction. "Recently, we have observed gradual strengthening and signs of price firmness in some markets," he added.

Hammermill Paper Co.'s 48% drop in first-quarter net was attributed to a "negative pricing effect" caused by

The U.S. paper industry had an unspectacular first quarter.

	First quarter ($000)			
Companies	Sales	Change 1985/84	Earnings[1]	Change 1985/84
Boise Cascade	$957,520	−1.0%	$33,280	19.4%
Bowater	216,419	7.5	15,082[2]	73.1
Champion Intl[3]	1,645,814	43.4	43,756	50.2
Chesapeake	81,773	10.8	4,373	63.0
Consolidated	185,184	8.2	27,365	40.6
Crown Zellerbach	762,000	7.6	19,200	− 9.4
Federal Paper	153,341	10.4	2,291	−54.0
Fort Howard	308,688	0.8	33,194	12.0
Georgia-Pacific	1,580,000	6.2	49,000[2]	14.0
Glatfelter	72,505	−14.4	10,395	9.9
GN Nekoosa	498,200	8.5	13,900	−53.2
Hammermill	428,050	1.0	7,922	−47.7
International Paper	1,130,000	− 1.7	37,100	−32.9
James River (1/27)	582,636	4.7	14,864	−28.3
Kimberly-Clark	1,001,800	11.0	72,300[2]	35.9
Longview (1/31)	116,437	16.3	3,877	55.2
Louisiana-Pacific	270,990	−12.3	−1,300[2]	n.m.
Mead	670,400	2.0	23,600	9.3
Mosinee	47,047	− 9.8	1,847	−28.0
Pentair	145,314	21.7	6,096	5.4
Pope & Talbot	83,053	3.3	2,200	4.3
Potlatch	234,700	− 6.2	11,500	− 8.0
Scott	696,200	1.1	42,100	23.1
Sonoco	184,761	1.3	10,785	4.2
Southwest Forest	170,484	− 2.5	− 1,604	n.m.
Stone Container	307,115	− 2.7	8,087	225.0
Temple-Inland	313,500	0.0	21,700	4.3
Union Camp	463,687	− 5.5	29,765	−29.5
Wausau (2/28)	49,306	− 8.1	845	3.2
Westvaco (1/31)	429,503	3.7	22,731	15.6
Weyerhaeuser	1,275,700	− 0.1	38,248	4.4
Willamette	287,924	1.4	14,271	74.3
Total	**15,368,691**	**5.7**	**618,770**	**2.6**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. **Bowater:** excludes 1984 quarter loss of $573 million from discontinued operations; **Georgia-Pacific:** excludes 1984 $8-million income from discontinued operations, includes 1985 $19-million pre-tax gain on timberland sales; **Kimberly-Clark:** excludes 1984 $7-million gain on stock exchange; **Longview Fibre:** excludes $2.2 million 1984 forgiven taxes; **Louisiana-Pacific:** excludes 1984 $18.7-million gain on sale of Natl. Gypsum shares, and 1985 $3.7-million gain from rebated FTC fine.
3. First quarter 1984 is first full quarter in which 100% of St. Regis earnings are consolidated with those of Champion.

increased domestic production and imports, worldwide supply and demand imbalances, and the strong U.S. dollar. Uncoated business papers account for more than half of Hammermill's earnings.

Another firm hit by adverse exchange rates is International Paper Co., which reported a 33% drop in earnings. "The strong U.S. dollar has affected our earnings by decreasing the price of exports and lowering export volume . . . we think prices have hit bottom and we expect upward movement in some product lines in the second quarter," said John A. Georges, International Paper's chairman and CEO.

Paperboard and packaging. Stone Container Corp. reported a surprising 225% increase in earnings on a 3% drop in sales, reflecting "reduced costs and expenses," according to the company's chairman Roger W. Stone. But Stone predicted a "difficult" second quarter this year, due in large part to planned mill shutdowns and price erosion.

Union Camp Corp., also a major uncoated free-sheet producer, posted a 29.5% decline in profits on a 5.5% decline in sales. "The strong dollar also made U.S. linerboard more expensive and therefore less competitive in foreign markets. This resulted in decreased exports, which caused an oversupply in domestic markets," chairman and CEO Peter J. McLaughlin noted.

Temple-Inland Inc. showed a 4.3% increase in profits on flat sales. Company sources noted that high containerboard inventories "caused the corrugated box market to become very competitive late in the quarter, resulting in an extremely irrational pricing environment."

Forest products. Weyerhaeuser Co. reported a 4.4% increase in first-quarter profits on a slight decline in sales. George H. Weyerhaeuser, president and CEO, noted, "Our northwestern lumber and plywood mills are producing results that range from significant losses to marginal profits." He said the company was "bombed" in 1984 and was "still feeling the impact on domestic prices of imported fiber products, low-cost foreign fiber capacity, and an overcapacity in solid wood products." ■

EXPANSION

Con-Bath to market bleached Bathurst CTMP

To cut losses at its Ellesmere Port, England, newsprint mill, known as the Bridgewater mill, Consolidated-Bathurst Inc. plans to restructure the mill's operations. Currently, chemithermomechanical pulp from the mill in Bathurst, N.B., (*shown above*) is shipped to the U.K. to supply over 60% of the fiber for newsprint production at the Bridgewater mill (*P&P*, Oct. 1984, p. 80).

As now planned, a C$40-million expansion of the 89,000-tpy deinked pulp plant at the Bridgewater mill will increase the plant's capacity between 35% and 55%, or 30,000 to 50,000 tpy. The proportion of deinked pulp in the mill's furnish, currently about 35%, will rise to about 50%. The proportion of CTMP supplied by Bathurst will be cut in half, to 80,000 tpy, and the remainder of the mill's fiber needs—some 30,000 tpy—will be purchased on the European market.

Market CTMP. On the other side of the Atlantic, a $16-million bleach plant using new technology developed by Ingersoll-Rand Canada and the Pulp & Paper Research Institute of Canada will be installed at the Bathurst CTMP mill. Con-Bath plans to bleach the 80,000 to 85,000 tpy of CTMP not required at the Bridgewater mill and sell it on the open North American market. Startup of the new bleach plant is scheduled for the fall of next year.

There are several advantages to producing market CTMP at Bathurst, according to Bart Duns, Con-Bath's vice president of pulp, kraft, and paperboard. One advantage is economies of scale. Bathurst has capacity for 360 tpd of semichemical pulp and 400 tpd of corrugating medium in addition to the 480-tpd CTMP mill. Having two CTMP lines is also important, Duns says, because it gives the mill the flexibility to vary pulp freeness from 90 to 500 to suit different applications. The new bleaching technology is cited as a third factor.

Producers of tissue and toweling comprise one set of potential customers for the new product, according to Duns. Because of the freeness of its product and the new bleaching technology, Con-Bath foresees a market among printing and writing producers as well.

Matane project. In a separate announcement, Con-Bath said that it was terminating its joint study with the Société Gènérale de Financement du Quèbec, a provincial agency, to investigate a possible bleached CTMP mill in Matane, Que. The plan was dropped after certain required conditions for the project could not be met, the company said. Plans had called for a 180,000-tpy facility to be owned jointly by Con-Bath and SGF. ■

CAPITAL SPENDING

U.S. paper companies to trim capital spending plans

Keeping in line with the recent cooling off in the economy, U.S. pulp and paper companies have scaled back their capital spending plans somewhat from earlier estimates, the Commerce Dept.'s Bureau of Economic Analysis reports. In a recent survey of U.S. business capital spending, conducted between January and March, paper companies reported plans to spend $7.83 billion on new plants and equipment in 1985.

That figure is down 7.1% from the spending plans of $8.43 billion reported in the last survey, conducted in October and November. The new figure still represents an increase of 9.6% over the record spending of $7.42 billion in 1984.

The latest BEA survey shows an 8.7% increase in planned spending for all U.S. business in 1985 and an 11.0% increase for the manufacturing sector. For nondurable manufacturing, the average planned increase for 1985 is 8.5%. The paper industry's planned 9.6% increase puts it fourth among nondurable goods manufacturers, behind the food and beverage industry—17.0%, chemicals—13.3%, and rubber—10.6%.

In addition to the new spending estimates, BEA has issued revised price deflators to adjust spending for inflation. The latest deflators prepared by the BEA indicate that capital goods prices increased 1.0% in 1984 and are projected to rise 1.3% in 1985. That compares with earlier estimates of 0.8% for 1984 and 1.5% for this year.

McGraw-Hill Economics' most recent survey of spending plans, conducted in January and February, estimates that paper company spending in the U.S. will total $7.46 billion in 1985, up 3.2% from estimated outlays of $7.23 billion in 1984.

McGraw-Hill also estimates that the paper industry will spend $8.39 billion on capital projects in 1986, an increase of 12.5% compared with this year. U.S. business as a whole will up capital expenditures 10.9% in 1985, and spending in the nondurables sector will rise 13.1%, according to McGraw-Hill.

Most major U.S. paper companies plan to increase capital outlays in 1985 or hold them steady at relatively high levels, according to a survey of recent annual reports. Georgia-Pacific Corp., for example, plans to boost spending for capital projects 100% in 1985 to about $700 million. G-P has major conversion projects underway in Crossett, Ark., and Monticello, Miss., and a new machine scheduled for 1986 startup at its Port Hudson, La., mill site.

International Paper Co.'s spending will rise 24% in 1985, even though its $500-million Georgetown, S.C., modernization was completed last year. The company plans to spend $590 million in 1985 on major conversions in Pine Bluff, Ark., and Mobile, Ala., among other projects.

Spending will decline at Crown Zellerbach Corp., Great Northern Nekoosa Corp., and Union Camp Corp., following the completion of recent major expansion projects by all three companies in 1984.

Champion International Corp. will hold capital improvements to about $400 million in 1985 and will postpone several major expansion projects until debt incurred in the acquisition of St. Regis Corp. last fall is reduced. Postponed projects include an uncoated free-sheet machine for the Quinnesec, Mich., market pulp mill (previously scheduled for 1987 startup), a lightweight coated paper machine at one of the former St. Regis mills, and a new off-machine coater for the Courtland, Ala., mill. Even with these cutbacks, however, Champion International's outlays this year will only decline by approximately 1% compared with its expenditures last year. ■

Capital spending plans of major North American paper companies (millions of $).

U.S. companies	1985	1984	% change 1985-84
Boise Cascade	$400	$456	−12.3%
Bowater	370	181	104.4
Champion International	400	405	−1.2
Consolidated Papers	147	59	149.2
Crown Zellerbach	190	252	−24.6
Federal Paper	50	44	13.6
Fort Howard Paper	200	157	27.4
Georgia-Pacific	700	350[1]	100.0
Great Northern Nekoosa	100	231	−56.7
International Paper*	590	476	23.9
Kimberly-Clark	450	382	17.8
Louisiana-Pacific	130	181	−28.2
Mead	92[2]	176	−47.7
Pentair	50-60	36	53.0
Potlatch	98	33	197.0
Scott Paper	450[3]	286	57.3
Sonoco	45	34	32.4
Southwest Forest Industries	38	43	−11.6
Stone Container	44	42	4.8
Temple-Inland	200	130	53.8
Union Camp	240	316	−24.1
Weyerhaeuser	450	383	17.5
Willamette Industries	31	31	0.6
Canadian companies			
Abitibi-Price	C$225	C$126	78.6
Consolidated-Bathurst	160	119	34.5

*Excludes capital outlays for timberland, other nonpaper/paperboard assets.
1. Excludes $360 million for purchase of mill from St. Regis.
2. Includes spending scheduled to continue into 1986.
3. One half of the $900 million expected to be spent in 1985 and 1986.

Source: Recent company statements and annual reports.

P&P exclusive survey: Trends in bleaching equipment, chemical use

The diverse application of technology continues; substitution of cheap bleaching chemicals and new mixing equipment applications popular

By MICHAEL J. DUCEY, Technical Editor

■ This article reports the results of *Pulp & Paper*'s third annual survey on bleaching. After tracking chemical consumption and newly applied technologies over the last three years, this year's report looks at the growth and trends of bleaching chemicals and equipment.

Participation in the survey has been tremendous. More than 150 people have responded to questionnaires and phone calls regarding the state of pulp bleaching and its effect on the industry as a whole. Seventy mills, representing 18 million fully bleached tpy, are involved, while 60 suppliers have helped in following applied technology trends. Canadian pulp bleacheries have also been included in the chemical usage survey, and their profile is presented in Table 1.

A separate report is mailed to each of the survey respondents, allowing them to evaluate the survey information in more detail. At the close of 1985, an online database of information will be available for personal computer users.

Pulp bleacheries are facing many economic and environmental pressures today. It is common knowledge that pulp prices are currently in a slump, chiefly due to the continued strength of the U.S. dollar. This puts all pulp operations on alert for production cost reductions to ease the effects of a declining market. It also leads to unscheduled downtime, which is not conducive to maintaining quality or efficiency. Finally, more competition is on the horizon as additional bleached pulp and white papers capacity comes online.

CHEMICAL DEMAND. Measures can and have been taken to avert the problems mentioned above. Substitution of cheap or excess chemicals is one of the oldest and most widely used cost-cutting measures. Table 2 identifies the number of mills in North America using this method.

The supply of bleaching chemicals should be stable during the next several years. Sodium chlorate, the chief reactant used in producing chlorine dioxide with onsite generation equipment, will be available from expanded sources in the U.S. South and Canada. On the other hand, chloralkali manufacturers have felt the effects of oversupply and are now beginning to achieve price stability. Chlorine prices have recently jumped $10/ton, and steady increases are likely if housing and other key industries continue to show growth.

Oversupply may be a problem for peroxide producers, as two companies have announced capacity expansions, and a new producing plant is planned in Canada for a 1987 startup. The major growth area for peroxide remains in groundwood bleaching, as chemical pulp bleachers have been slow to substitute or add peroxide to their bleaching sequences. The cheapest bleaching chemical continues to be oxygen, and its use has increased largely due to the development and application of dynamic mixing equipment. This trend is expected to continue strongly in both substitution and complete sequence additions, especially among mills converting to white papers.

Table 3 shows the work of mill engineers at Weyerhaeuser Canada's Kamloops, B.C., mill and how they used hypochlorite while other chemicals were in short supply.

DYNAMIC MIXING EQUIPMENT. Figures 2 and 3 show the growth of dynamic chemical/pulp mixers broken down by chemical and supplier. All operate at medium (10% to 15%) consistency, are available in two sizes, and are recommended for use with preretention tubes. A number of users of these units have documented very attractive paybacks (less than half a year in the best case, a full year in the worst case), primarily due to the reduction of chemicals consumed throughout the process. The chemical/pulp mixers do not have excessive power requirements, but they do require sufficient room for installation.

Growth in the use of these mixers stems from the fact that traditional tower mixers do not sufficiently mix pulp and chemicals into a homogeneous blend. Chemicals are added to the pulp through one or two nozzles located in mixing zones at the bottom of the tower. These zones are maintained with low-speed impellers and fixed baffles. However, stationary sections of the

TABLE 1: **Breakdown of Canadian bleach respondents, grouped geographically and by size.**

Total mills surveyed	**38**
Answered by mail	14
Answered by phone	12
Tonnage represented by survey (metric tpy)	5,160,000
Capacity (%)	47.6
	Number
Geographic distribution	**of lines**
East	10
Central	6
West	15
Size distribution	
Over 700 metric tpd	4
400 to 700 metric tpd	23
Under 400 metric tpd	4
6-tower plants	18
5-tower plants	9
4-tower plants	4

TABLE 2: **Use of chemical substitutes in the U.S. and Canada.**

U.S.	**Number of mills**
Cd	26
E_o	20
p	10
hypo	16
Canada	
Cd	20
E_o	16
p	6
hypo	6

pulp plug can occur, shortening the residence time of pulp passing through the tower. Sections of the top of the rising pulp plug sometimes show a strong greenish-yellow color as a result of high amounts of residual chlorine or chlorine dioxide.

The Swedish Forest Research Institute (STFI) and others have studied the effects of nonhomogeneous mixing and have concluded that as the deviation from ideal mixing increases, the amount of bleaching chemicals required to reach a given mean bleaching result rises considerably.

One report investigating the distribution of ClO_2 in a common tower arrangement concluded that dynamic mixers more than justify the cost of replacing tower mixers because of their superior mixing and chemical consumption advantages.[1] Mill officials of Stora Kopparberg undertook a study at their Skutskär mill using a method involving the injection of a LiCl solution with pulp and ClO_2 and drawing data from samples taken radially across the top of the D-stage towers. High overdosages in the center of the tower and along the periphery of the tower were found. The mill tried to improve the efficiency of the existing equipment but discovered that reducing pulp flow through the tower, increasing the power input in the mixing zone, and reducing pulp consistency all had minimal effects on mixing efficiency. The mill did not see substantial improvements until the installation of a Kamyr MC dynamic mixer, which is now saving $2 to $3/ton of pulp produced because of reduced chemical consumption. The mill has since fit all of its D-stage towers with the mixers and has virtually eliminated nonhomogeneity of the pulp mixture.

Kamyr has stated that its medium-consistency pump can act as a mixer in the same manner as its MC mixer. Kamyr has four installations currently using the MC pump in this dual function. Because the pump operates on the principle of fluidization, as do other dynamic mixers available on the market today, it seems possible that this type of equipment will replace dynamic mixers altogether.

ONSITE CHEMICAL GENERATION. As a new addition to the survey this year, manufacturers of onsite chemi-

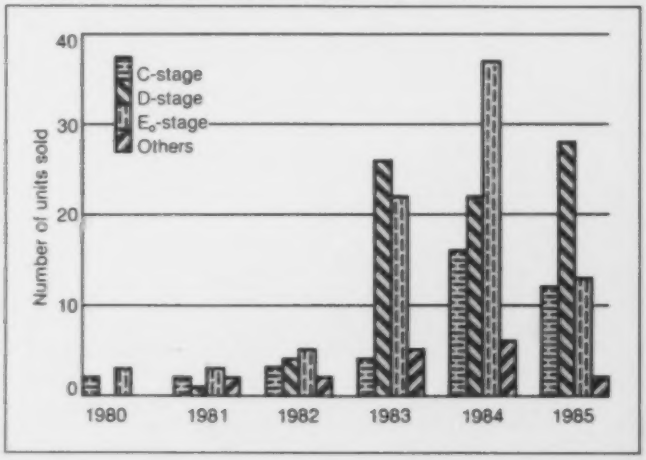
TABLE 3: **A summary of the modified sequences using hypochlorite and the respective ClO_2 saving.**

Sequence	**Hypo lb/ton**	**ClO_2 saving lb/ton**	**tpd**	**TAPPI brightness**
C_DEDED	0	0	0	90+
$C_DE/HDED$	40	6	3.0	90+
C_DEDE/HD	10	6	3.0	90+
C_DEH/DED	15	8	4.0	90+
C_DEH/D	15	5	2.5	88+
C_DEHE/HD	30 + 5	22	11.5	89+

TABLE 4: **Operating specifications for dynamic mixers.**

	Rauma-Repola	**Kamyr**	**Impco**	**Sunds Defibrator**
Sizes	3	2	2	2
Dimensions (ft³)	47	45.5	57	50
	70	74.5	79	86.5
rpm	530	1,000	980	735
	680		650	
Motor (hp)	125	150	125	100
	200	200	200	270
Consistency	10 to 15	8 to 16	10 to 15	3 to 15
Total installations	**13**	**113**	**59**	**70**

FIGURE 1: **Worldwide installations of chemical mixers.**



cal generators were asked to comment on the future of their products in the pulp and paper industry. Many suppliers said this equipment is a "hard sell," particularly in the U.S. Close proximity to chemical sources, adequate delivery times, and stable (and sometimes depressed) chemical prices account for this situation. Of course, this is not the case in many other countries, and this type of equipment is being sold in fairly large numbers. Three startups in the U.S. are reported for the last 12 months.

Two suppliers, Chemetics and Lurgi, offer fully integrated bleach chemical manufacturing plants. Chemetics uses a chloralkali system using brine as the major reactant to form chlorine gas and caustic solution in an electrochemical cell. Hydrogen and sodium chlorate are coproduced by electrolysis of treated sodium chloride brine in a "diaphragmless electrolyzer." The hydrogen produced is sent with some chlorine to manufacture hydrochloric acid. HCl is formed in a synthesis unit where H_2 burns with the Cl_2 gas, forming HCl, which is then absorbed in soft water. HCl is transferred to the chlorine dioxide generator where it reduces sodium chlorate to produce ClO_2.

Lurgi offers a similar package, the chief difference being the chlorine dioxide generating process, which is the patented Munich process. The Munich process is a "closed" system consisting of cells arranged in two rows and connected electrically in series to a transformer/rectifier unit. Spent chlorate electrolyte reacts with brine to form sodium chlorate and hydrogen. A major portion of the chlorate electrolyte is recirculated into the cells via an electrolyte reaction tank. Hydrogen is sent to an HCl synthesizer, while NaClO3 moves on to the chlorine dioxide generator. Reaction of the HCl and NaClO3 takes place in a perpendicular multiple-compartment reactor, which is temperature controlled by low-pressure steam. The products are ClO_2 (absorbed in chilled water and stored), Cl_2 (transferred to the HCl synthesizer), spent brine, and water. This process can be connected with a membrane-type chloralkali electrolysis unit.

Neither company has sold many fully integrated systems, but each of them has had some success in starting up single-process units. Many other reputable equipment manufacturers sell either chlorine dioxide generators or chloralkali generators alone, and some manufacturers mentioned that if the market did take off for onsite chemical generation, they would be able to integrate their systems.

One of the reasons that ozone bleaching has not become a major factor in the industry (despite years of research confirming its ability to bleach pulp) is because its onsite generating capability is uneconomical. But hope may be on the horizon. A firm in Japan maintains that it has successfully started up a pilot-scale ozone generator that can produce the chemical at roughly one-third the cost of common U.S. generators.

FIGURE 2: **Annual growth of chemical mixers per suppliers.**

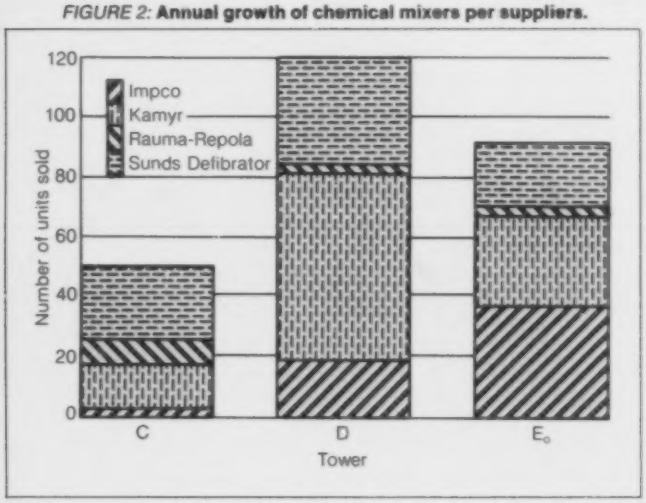
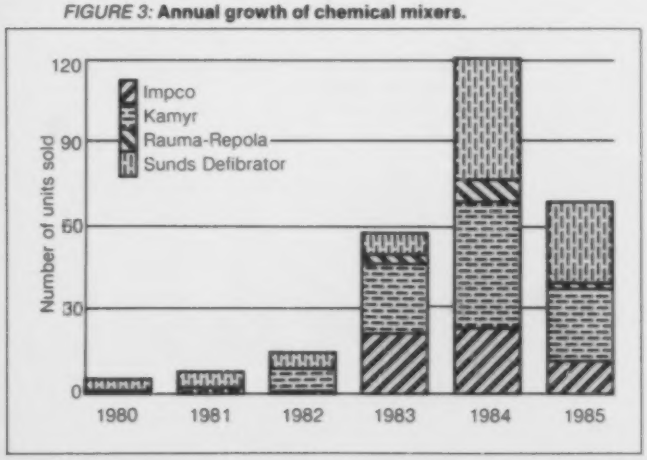


FIGURE 3: **Annual growth of chemical mixers.**



THE CHANGING BLEACHING SEQUENCE. As in chemical addition, trends continue in displacement, split, and short sequence bleaching. Worth noting is International Paper Co.'s decision to switch technology and suppliers for its two recently installed bleach plants. IP's Georgetown, S.C., mill recently started up the largest displacement bleaching system in the world and its Mobile, Ala., plant plans to install the new three-stage "low-level" system later this year.

Also, the fact that two of the three latest greenfield mills in the U.S. will operate conventional plants (Champion International Corp., Quinnesec, Mich., and Leaf River Forest Products Inc., New Augusta, Miss.) with the other mill (Union Camp Corp., Eastover, S.C.) using oxygen delignification, makes it tough to predict what technology will be applied next.

Two bleach plants, Georgia-Pacific Corp.'s Crossett, Ark., facility and Consolidated Papers Inc.'s Wisconsin Rapids, Wis., plant, split their sequences last year, chiefly through the introduction of oxygen with dynamic mixers at the E1 stages. James River Corp.'s Naheola, Ala., mill has announced plans to convert two bleaching lines into three with help from dynamic mixers and more efficient chemical consumption targets. Two other mills have studied this concept, but they have not taken action.

The invention of the Kamyr continuous diffuser still dominates that company's new bleach plant product line, along with displacement bleaching (a second system will be added in Japan in 1985) and the diffusion washer. An upgraded oxygen system is being promoted to challenge the short sequence systems offered by Impco and Sunds Defibrator.

Sunds has been offering a three-stage, rapid mixing system for the last four years using Sweden's Norrsun-

(Continued on p. 66)

FIGURE 3: **Simplified model.**

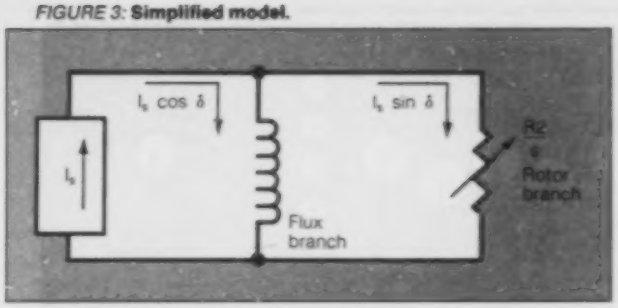


FIGURE 4: **Vector diagram for the control system.**

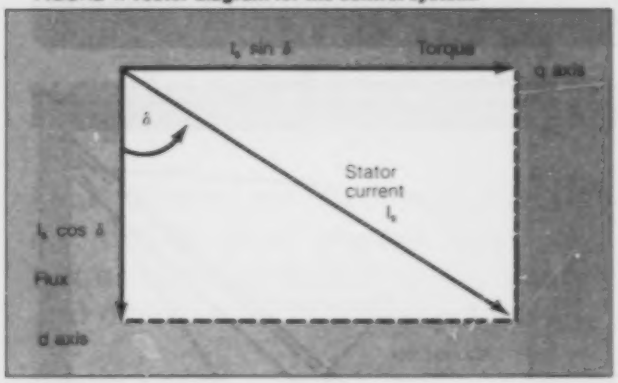
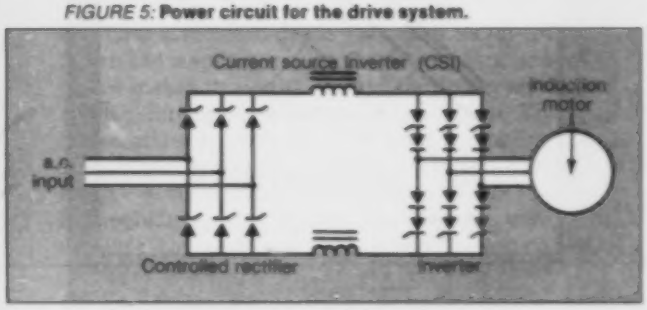


FIGURE 5: **Power circuit for the drive system.**



tor. As more torque is required, this speed difference, or slip, of the motor increases. In frequency-programmed drives, the stator electrical speed is fixed, and thus the rotor speed must change with load. In vector control, the output frequency is correctly adjusted to maintain constant rotor speed regardless of load.

Information on the flux position is required to implement the control strategy. Since imbedded flux sensors in the motor windings are impractical, most techniques use a shaft encoder to provide rotor position information. Since the instantaneous rotor-position is known, the instantaneous phase angle and magnitude of the stator current can be produced, and the torque angle can be directly controlled. Dynamic torque response of 10 milliseconds and speed regulation of 0.3% of base speed is reasonable. Transient response is excellent since the torque angle is under constant control.

The current source inverter is commonly used for this type of control since its directly controlled outputs are frequency and current. The power circuit is inherently regenerative without additional power components (Figure 5). It operates through all four quadrants without bridge crossover problems or problems due to discontinuous current since the minimum magnetizing current of the induction motor is always present. ■

CHEMICAL BLEACHING SURVEY

(Continued from p. 66)

det market pulp plant as its show piece. Impco is now challenging this product with a system that promises flexibility, reliability, low capital cost and low operating costs. The plant is said to have minimum space requirements, low head requirements and thus lower power consumption and higher operating consistencies to save on chemicals and steam.

With all the laboratory success in electrochemical bleaching it seems feasible that this process will be challenging chemical bleaching systems in the next decade. A report from Egypt described an apparatus using seawater to bleach sulfite and kraft pulps.[2] Pulps achieved 75% GE and 70% GE, respectively. The rate of kraft bleaching appears from the data to be faster than sulfite bleaching. Viscosity of the pulps was comparable to other single-stage prepared pulps, while effluent color was lower, as would be expected. Small additions of chromium salts enhance the process by reducing power input and suppressing corrosion and hypochlorite reduction at the cathode. In addition, current efficiency is improved.

A commercial product called "The Pulper," a batch unit built as large as 100 tpd, will bleach pulp to 90% GE. This unit uses saltwater and a patented anode/cathode configuration that liberates free radicals and other bleaching agents.

HIGH-TECH BLEACHING. Touch screens, "smart" transmitters, and linkable hardware are currently the most popular process automation topics, with artificial intelligence being the most talked about software. Very little new has been announced in sensor technology, but the existing products seem to be doing quite well in the marketplace.

The survey revealed that capital expenditures for automation equipment are not on the level of chemical mixers, but they are growing at a steady pace. Large systems often encompass other mill operations, especially with the availability of totally integrated control schemes. The range from sensor control to process-wide control in terms of dollars is $20,000 for a single-stage to $2 million for a five-stage sequence. Discounting may also become a factor in this market.

METALLURGY BREAKTHROUGH. Another development gaining interest is the introduction of Hastelloy Alloy-22, a new metal from Cabot Corp. Alloy-22 is formulated as 22% chromium, 13% molybdenum, and 3% tungsten to increase acid corrosion resistance and thermal stability properties and to accept a compromise of the localized corrosion properties and the uniform corrosion resistance in nonoxidizing acids. Applications in bleach plant scrubbers and washer drums were among the first to be documented. ■

REFERENCES

1. Hakan Kolmodin, "How to save costs by mixing chlorine dioxide and pulp homogeneously," *Svensk Papperstidning* (November 1984): 8.
2. M.N. Nassar, "Electrochemical bleaching: a novel method for bleaching kraft and sulphite pulps," *Journal of Pulp and Paper Science* 11, no. 1 (January 1985): 17.
3. R.W. Chan and J.R. McDonald, "Modified bleaching sequences," *Pulp & Paper Canada* 86, no. 1 (January 1985): 42.